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CLAIM + DETAILED DESCRIPTION

[Claim(s)]

[Claim 1] Kneading refractories which add poorly soluble tripoli aluminium phosphate 0.1 - 3.0 weight parts in water, add and knead water 4 - 10 weight parts to 100 weight parts of the unshaped refractories which mix an alumina cement as a binder into a fireproof material, and are characterized by things.

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the kneading refractories which are packed up where adding-water kneading is carried out especially beforehand, and are shipped about the unshaped refractories for casting shaping used for lining of various molten metal containers, such as a shaft furnace hot iron runner and tundish.

[0002]

[Description of the Prior Art] The unshaped refractories for casting shaping are used for slushing the refractories which carried out adding-water kneading in molds, such as a core, and fabricating a construction object. The flowability does not change until it constructs adding-water kneaded material, but as for after the completion of construction, it is desirable to have the hardening hardness of the grade which can remove a mold promptly. And after removing a mold from a construction object (it is called the following "unmolding"), the binder contained in kneaded material carries out hardening sintering with heating at the time of performing stoving for removing the moisture contained in a construction object.

[0003] As this kind of unshaped refractories, the hydraulic castable refractories which used the alumina cement as the binder are making the mainstream. And conventionally, immediately after carrying out adding-water kneading of the refractories by which packed packing was carried out with the complications-like object generally in a construction site, it slushes in a mold, and it is the hydration reaction of an alumina cement. Although it was made to harden and the construction object was formed, dust

disperses at the time of adding-water kneading of refractories, work environment was worsened, and also since work took the help, there was a tendency which cannot reply to the demand of laborsaving in recent years.

[0004] What carried out adding-water kneading in the manufacture stage of refractories is packed up with the bottom of such a background, The hydration reaction advances very quickly, and if an alumina cement passes as long as 2 hours after adding-water kneading, it will lose flowability and will stop fitting casting shaping the high summer of atmospheric temperature etc. compared with Portland cement which is the binder of common concrete, although shipping is proposed.

[0005] Then, these people do not use an alumina cement as a binder previously. What made poorly soluble tripoli aluminium phosphate this water with the binder, and was mixed into a fireproof material based on knowledge if poorly soluble tripoli aluminium phosphate is used for water, that the flowability after adding-water kneading will be held [a long time] The refractories which kneaded water were proposed (JP,55-85475,A). Since a cure reaction does not advance for about one month by preservation by a room temperature grade but these kneading refractories hold flowability required for construction, they can be satisfied in respect of a life cycle.

[0006]

[Problem(s) to be Solved by the Invention] However, since discovery of the hardness after construction is dependent on the condensation reaction of tripoli aluminium phosphate by heating. In order to obtain sufficient hardening hardness for unmolding, it is necessary to heat at high temperature of 300 degrees C or more. A binder (tripoli aluminium phosphate) moves to the construction body surface which is easy to receive heat during heating, it is condensed the work not only becomes complicated, but, there is a tendency which produces phenomena, such as foaming and a crack, and it had the problem that a construction object tended to become an uneven and weak organization as a result.

[0007] Moreover, in high temperature heating of 300 degrees C or more, it changed, even if the mold was metal, and it has been regarded as questionable that it also becomes impossible to be equal to repeated use.

[0008] Moreover, although these people are JP,59-8673,A numbers and proposed the refractories which add poorly soluble tripoli aluminium phosphate in water as the concrete retarder, using an alumina cement as a binder In order that this may plan adding-water kneading in a construction site fundamentally, special consideration is not made about the daily dose of the water which should be added.

[0009] This invention was made in view of a situation which was mentioned above, and [the purpose] While being the kneading refractories by which adding-water kneading was carried out in the manufacture stage and being able to hold flowability required for construction [the long time of 12 hours or more] It is in offering the kneading refractories which after construction can make able to discover hardening hardness comparatively sufficient by heating of the degree of low temperature, can have it, and can acquire the construction object of a uniform organization.

[0010]

[Means for Solving the Problem and its Function] [the kneading refractories concerning this invention] in order to attain the above-mentioned purpose To 100 weight parts of the unshaped refractories which mix an alumina cement as a binder into a fireproof material,

poorly soluble tripoli aluminium phosphate 0.1 - 3.0 weight parts are added in water, and water 4 - 10 weight parts are added and kneaded, and it is characterized by things.

[0011] As a fireproof material, aggregate, such as the usual material currently used by castable refractory etc. from the former, i.e., alumina, silicon carbide, bauxite, and graphite, silica, the microscopic particles of alumina, etc. are used. Such fireproof material is suitably chosen according to the form of a construction object, a size, thickness and an operating condition, i.e., temperature, the gas that contacts, a molten metal, molten slag, etc., and a grain size is adjusted and used for them. Moreover, you may add powdered pitch, kaolin clay, etc. if needed.

[0012] Poorly soluble tripoli aluminium phosphate has in water the function which controls hardening of the alumina cement which is a binder. Hardening is based on a hydration reaction, by contact with an alumina cement and water, a cement component carries out ion dissociation, and, specifically, a hydration compound is generated and hardened because a Ca^{2+} hydrogen exponent becomes supersaturation. Therefore, in order to stop the hardening, it is required to control a Ca^{2+} hydrogen exponent, and the acid in which PH of a hydrate is reduced is effective in this.

[0013] In the experiment of this invention persons, it became clear that it would not go on if the hydration reaction of an alumina cement is adjusted so that PH may become six or less with combination with an inorganic acid or an organic acid. Even if it heats after construction, it will stop however, hardening uniformly, probably because a depression effect will not be acquired by water from an undissolved acid, but the flowability of kneading refractories will be lost quickly, and a dissolution rate is too quick and inhibits a hydration reaction too much from water-soluble acids, such as aluminium phosphate, conversely.

[0014] Only when poorly soluble tripoli aluminium phosphate is adopted as water in these examination Hardening advance in the ordinary temperature of kneading refractories was controlled, even if 48 hours passed after kneading, when flowability required for casting work was maintained and it moreover heated, hardening was started from 70 degrees C, and it became clear that a hardening function was fully recovered at the temperature which is 80-90 degrees C, although the mechanism of the hardening inhibition by this tripoli aluminium phosphate is not necessarily in difference, it thinks about as follows.

[0015] That is, in order for poorly soluble tripoli aluminium phosphate not to dissolve in water immediately unlike other acids, [without going on the cation and anion originating in the component of refractories, and a rapid reaction] But after reacting alternatively only with the Ca^{2+} ion generated in process of the hydration reaction early stages of the existing reactant alumina cement, this reactant is expected to inhibit the hydration reaction which covers the alumina cement grain surface and continues. Moreover, it is thought of because the inhibited hydration reaction becomes active to harden by heating. As a result, when the hydration reaction of the alumina cement which is a binder advances, uniform hardness discovery in the construction object whole region will be obtained.

[0016] Although a hardening depression effect is accepted to an unshaped-refractories 100 weight part above 0.1 weight part, even if the loadings of this tripoli aluminium phosphate exceeds 3 weight parts, it serves as hindrance of hardening of the construction object after about [that there is no improvement in a depression effect] or construction.

Therefore, the loadings of tripoli aluminium phosphate carries out within the limits of 0.1 - 3 weight part.

[0017] The kneading refractories of this invention add and knead water in the powder-mixing thing which added poorly soluble tripoli aluminium phosphate in water at the above-mentioned unshaped refractories, and the moisture content is set as the range of 4 - 10 weight part. In the conventional unshaped refractories for casting, although a moisture content required to acquire flowability suitable for casting work changes with relative bulk density of the component of refractories, it is the range of 3 - 15 weight part in general. However, poorly soluble tripoli aluminium phosphate is added to water like this invention, and since separation of the moisture by the segregation and prolonged neglect of the fines portion by the vibration in the middle of conveyance arises if it is in some which carried out adding-water kneading in the manufacture stage, proper moisture management is needed. According to research of this invention persons, a moisture content required of this invention is within the limits of 4 - 10 weight part as mentioned above.

[0018] Moreover, in operation of this invention, dispersants, such as organic polymer polysaccharide, and a methyl cell rose, sodium alginate, can also be added for separation of moisture, or segregation prevention of a fines portion.

[0019]

[Example] A work example is explained below. By combination shown in Table 1, the work example and comparative example of this invention were created. Work examples 1-3 and comparative examples 1-3 are a fireproof material. Alumina with a mean particle diameter of 1-8mm and silicon carbide with a mean particle diameter of 1-5mm are used as aggregate. this -- alumina fines with a mean particle diameter of 0.25mm or less -- said -- silicon carbide fines of 1mm or less and the superfines of silicon carbide, powdered pitch, and fire clay were mixed and constituted from a ratio shown in Table 1, respectively, the alumina cement and a small amount of deflocculants as a binder were added, and unshaped refractories were obtained. Work examples 4 and 5 are the cases where the thing which added bauxite with a mean particle diameter of 1-8mm and spinel aggregate further as a fireproof material, respectively, and a comparative example 4 do not use an alumina cement.

[0020] And a comparative example 3 is that in which work examples 1-6 and a comparative example 2 added the silicate of soda whose comparative example 4 is a thermosetting binder about a water-soluble-phosphate aluminium again to only the quantity of Table 1 having added poorly soluble tripoli aluminium phosphate in water to 100 weight parts of the above-mentioned unshaped refractories, respectively. It is. In addition, a comparative example 1 is an example of the conventional general unshaped refractories for casting.

[0021]

[Table 1]

Work examples 1-6 were hardened with heating at a comparatively low temperature of 90 degrees C, and have discovered hardness while they are in the state which the hydration reaction after adding-water kneading all stopped, slushed in ordinary temperature (20 degrees C) while after 48-hour progress had been uncured, and was suitable for shaping, so that clearly from Table 1. The work examples 1-3, and 5 of the loadings of moisture

are 5.5 weight parts, and, as for the work example 4, loadings is increasing in 8.0 weight parts from the relative bulk density of bauxite. While the work example 6 made moisture loadings 6.0 weight parts, the methyl cell rose was added as a dispersant, but it is using together with poorly soluble tripoli aluminium phosphate in water, and the effect of this invention is acquired.

[0022] On the other hand, a comparative example 1 is understood that time after the hydration reaction is advancing and carrying out adding-water kneading in ordinary temperature until it can use for construction is dramatically short, and adding-water kneading work [in a construction site] is required. Moreover, since a comparative example 2 also has too little loadings of tripoli aluminium phosphate, by the time it stops hardening in ordinary temperature, it will not have resulted.

[0023] since that flowability falls sharply and is missing at the function as an object for casting construction as a result of adding a water-soluble-phosphate aluminium, and proper shaping cannot be performed became whether to be difference, the comparative example 3 stopped subsequent characteristics investigation. Moreover, although a comparative example 4 has a keeping quality in ordinary temperature, in 90-degree C heating, even when it does not harden and it is stiffened at high temperature, it is lacking in hardness discovery nature, and inferior in the performance as lining material of a molten metal container.

[0024] In addition, flowability and a flow value are JIS. R It is the technique specified in 9 of 5201, and 7 clause, and the flowability after kneading was measured.

[0025] after slushing and sealing each kneading material in the cylindrical metal pattern of diameter [of 50mm] x50mm height and care-of-health hardness recuperates itself at the temperature of 90 degrees C for 12 hours, it is uncured -- it was -- it unmolds except for a comparative example 3, and each bending strength is measured.

[0026] Moreover, calcination physical properties are JIS about each kneading material. R It slushed into the die specified to 2653, and what comparative examples 1 and 2 carry out work examples 1-6 at 90 degrees C, are carried out in ordinary temperature (20 degrees C), and carried out care-of-health hardening of 24 hours and the comparative example 4 at 300 degrees C for 24 hours, respectively was made into the specimen for 24 hours. After carrying out desiccation treatment of each specimen at the temperature of 110 degrees C for 24 hours, the bending strength and porosity were measured about what was calcinated at 1450 degrees C for x 3 hours.

[0027] The corrosion resistance test was stiffened using the predetermined-shaped molding die for an erosion test by the same method as the above-mentioned specimen for calcination physical properties, and made the specimen what carried out desiccation treatment for 110 degree-Cx 24 hours. The amount of erosion serves as smallness, so that a numerical value is small.

[0028]

[Effect of the Invention] As mentioned above, since flowability required for casting shaping is held [a long time] where adding-water kneading is carried out, it can pack up and the kneading refractories concerning this invention can be shipped, after carrying out adding-water kneading in a manufacture stage. For this reason, it is useful to suppress a development of the dust in a construction site and to improve work environment.

Moreover, since after construction discovers hardening hardness sufficient by heating of a comparatively low temperature, it does not have fear of the brittleness accompanying

high temperature heating, can make construction object tissue uniform, and also it does the outstanding effect so -- the mold for construction can be repeated and used.

[Translation done.]